Insights

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OFRI • IRFO

Pill shows promise in fighting white pine blister rust

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By Abigail M. Obenchain

Researchers are nearly done testing a pill that could greatly improve survival and growth of eastern white pine regeneration, reports OFRI's Tim Meyer, the project leader. In studies at sites near Temagami and Algonquin Provincial Park, seedlings planted without the pill experienced up to 86% mortality by year 5, while only 20-23% of those planted with the pill died. "By the end of this growing season, all of the remaining untreated seedlings will probably be dead," Meyer says.

White pine seedling infected with blister rust.
Photo: Tim Meyer

The pill under study contains a fungicide, an insecticide, and a fertilizer and is placed in the planting hole under the seedling. The young tree slowly absorbs the contents of the pill, which help it to resist white pine blister rust and the white pine weevil and to grow more quickly. The increased survival and accelerated growth give seedlings a competitive advantage over other vegetation and shorten the time of greatest susceptibility to blister rust infestation.

"The data we have so far indicate that this pill helps keep white pine growing strong until at least age 5, when we can start to manage blister rust through other means, such as pruning lower branches," Meyer says. "And the fertilizer, which accelerates growth, helps reduce the time until the crowns start to touch, which changes the microclimate, reducing moisture levels in the tree and discouraging blister rust from establishing."

White pine has extremely high economic, ecological, aesthetic, and cultural value. This species once dominated large areas of Ontario's Great Lakes-St. Lawrence and southern Boreal Forest regions, but today it occupies only a fraction of its former

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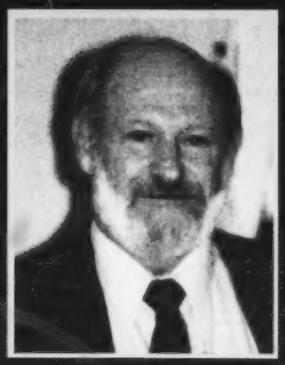
range, and it is regenerating poorly. Harvesting practices that favour regeneration of competitive species like balsam fir are part of the problem, but during the pill study, Meyer found that white pine blister rust caused all but about 10% of the mortality. "It's very difficult to find blister rust on tiny seedlings, because the signs and symptoms are very inconspicuous," he says. "Current thinking says that blister rust is a disease of older, established trees, but our results indicate that it can hit the main stem at a very young age."

An extremely aggressive fungal disease, blister rust was imported from Europe early this century. White pine has no resistance to it, and Meyer is very concerned that white pine could be reduced to the point where it is no longer a viable crop species. "Saving this species will require intensive management," he warns. "People are very concerned about saving *old growth*, but we are doing very little to protect *future* generations of white pine. This pill may be one practical tool for sustaining this highly valued species."

For more information, contact Tim Meyer at OFRI (ext. 220). Project partners include the Canadian Forest Service, Sault Ste. Marie; the MNR North Bay and Bracebridge district offices; and the former Teme-Augama Anishnabai, a First Nations group that was based near Temagami.

OFRI STAFF PROFILE:



Farewell to John Paterson

By Steve Colombo

After years dedicated to improving nursery and reforestation practices in Ontario, forest regeneration research specialist John Paterson has left OFRI to further his career in cabinetry. One of the original graduates of Sir Sandford Fleming's forest technician program, John started his research career in the early '70s working on the early stages of the forest ecosystem and ecological land classification work in the province. In the late '70s, he made the transition from technician to researcher and developed into an internationally recognized expert in nursery stock handling, planting, and reforestation.

Among John's major accomplishments was his contribution to the issue of multiple leadering in conifer seedlings. During the '70s and early '80s, Ontario bareroot nurseries were culling seedlings with more than one main stem. Up to 50% of some stocklots were discarded, representing millions of dollars in losses. While many researchers asked why multiple leadering was occurring, John asked whether multiple leadering affected field performance. As a result of John's research, it became clear that for the most part, multiple-leadered seedlings revert to single-leadered trees after planting, and he concluded that MNR could safely ship and plant these seedlings.

This example demonstrates John's ability to see a problem in light of the needs of the organization and to find a solution without getting sidetracked into interesting but non-essential issues. He could always be relied on to put issues into context and suggest practical solutions. A colourful character and a dedicated employee, John's contributions will be missed by all who had the honour of working with him.

Adaptive management successes showcased at Science Forum

By Lisa J. Buse

To find out more about where adaptive management has been applied in resource management in Ontario, look to the proceedings of the 1998 Science Forum on Adaptive Management, published recently by OFRI. It provides examples of how adaptive resource management has been used in other jurisdictions, summarizes bridges and barriers to using it more widely in Ontario, and suggests some high-priority resource management issues to which MNR can begin to apply an adaptive approach.

Adaptive management is a systematic process for reducing the uncertainties surrounding resource policies by implementing them experimentally, monitoring the results, and revising as necessary (see *Insights*, Vol. 3, No. 1). The science forum confirmed that this approach has already been used successfully in Ontario fisheries and wildlife management - in managing sea lamprey, identifying alternative salmon stocking strategies, evaluating Ontario's forest management guidelines for fish and moose habitat and tourism, and testing hypotheses related to lake trout ecosystems. The results reinforce the value of using the adaptive learning approach to accelerate improvements in fisheries and wildlife management.

According to Jim Baker, project manager of MNR's forest science strategy and forum committee chair, adaptive management is moving into forestry circles. He says MNR began seriously considering adaptive forest management in the early 1990s to address uncertainties around emulating natural disturbances and developing habitat guidelines. Although Ontario has encountered obstacles similar to those in other jurisdictions, interest in applying adaptive management is growing, e.g., to curtail legal challenges to forest management policies.

> ***The OMNR has already had many successful experiences with adaptive management; we should celebrate and build on them.***
>
> Ron Vrancart, October 1998

Another outcome of the forum was the identification of adaptive-management opportunities in Ontario, reports OFRI scientist and forum co-organizer Blake MacDonald. "The high level of participation and the commitment of the participants was great. They worked together to identify high-priority issues suitable for adaptive management programs." These issues include:

- *Great Lakes fisheries:* cage culture, salmonid stocking, quota setting
- *Inland lakes and rivers:* habitat impacts of water power generation, fish stocking, watershed planning
- *Sustainable forestry:* ecosystem effects of silvicultural treatments, indicators of sustainability, refinement of resource management guidelines
- *Wildlife management:* spring bear hunt (no longer relevant because it was cancelled in spring 1999), bullfrog harvest, moose population targets and harvest quotas
- *Parks and natural heritage:* acceptable uses in parks and protected areas, management of disturbances, design of an ecologically significant park system

Actions proposed to overcome barriers to implementing adaptive management in Ontario include:

- Accepting uncertainty and the need to manage for it
- Supporting adaptive management at all levels of government
- Applying risk assessment
- Reconciling conflicting legislation
- Sponsoring long-term studies
- Changing institutional structure and function from a top-down, hierarchical approach to a bottom-up process of policy development and evaluation
- Emphasizing teamwork, communication, education, and innovation
- Optimizing trust through stakeholder involvement at all stages
- Examining the real costs and benefits of traditional management
- Ensuring that the appropriate technical support is available (e.g., statistical and decision designs)

In his concluding remarks, MNR Deputy Minister Ron Vrancart stressed that the cost of not doing adaptive management can be high (e.g., court challenges) and that success will rely on partnerships among resource managers, scientists, and affected stakeholders.

MNR's science forum is organized biennially for participants from OMNR, other government organizations, non-government organizations, and private industry. The goal is to advance learning, facilitate discussion, and make recommendations to improve resource management.

Adaptive Management Forum: Linking Management and Science to Achieve Ecological Sustainability (Science Development and Transfer Series No. 001) is available from the Natural Resource Information Centre (800-667-1940; nric@epo.gov.on.ca) and OFRI (ext. 271; ofrin@gov.on.ca). For more information about MNR's adaptive management projects, contact Jim Baker (ext. 283) or Blake MacDonald (ext. 223) at OFRI.

Assessing the effects of Ice Storm '98 on eastern Ontario forests

By Abigail M. Obenchain

In early January 1998, a devastating ice storm hit eastern Ontario, south central Quebec, and parts of the northeastern United States. In Canada, the storm resulted in the deaths of at least 25 people; left 4 million others without power, some for more than a month; cost the economy at least $7 billion; and damaged millions of trees. About 600,000 ha of hardwood forests were affected in Ontario alone.

R.A. Lautenschlager, an OFRI scientist and co-leader of Ontario's ice damage science team, believes this ice storm was the largest forest disturbance of limited duration to hit North America since the last ice age. The damage took less than a week to occur and stretched from eastern Ontario to the Atlantic Ocean. In some areas, the ice deposits were twice as thick as any on record.

As maple syrup producers, woodlot and plantation owners, homeowners, and others watched their trees bend and crack under as much as 11 cm of ice, they began asking a lot of tough questions, including: *Which of the damaged trees will likely survive? Which of the damaged sugar maples can be tapped? Should tapping intensity be reduced? Will sap and timber production be affected? How can we minimize effects of the damage? Should we prune damaged trees? Should we salvage damaged trees? How will damaged ecosystems respond? How will damage affect local and regional economies?*

Resource agencies respond

A few days after the storm, the Ontario Ministry of Natural Resources (MNR) and the Canadian Forest Service (CFS) conducted an aerial survey to map damage to forests in eastern Ontario. Then MNR worked with the Ontario Ministry of Agriculture, Food, and Rural Affairs (OMAFRA) to produce and distribute preliminary guidelines for minimizing the storm's ecological and economic impacts on sugar bushes, woodlots, and plantations, based on expert opinion and a quick literature review. Extension notes and workshops were also put together.

According to Cathy Nielsen, a forest biodiversity specialist with MNR's Southcentral Sciences Section in Kemptville and co-leader of the ice damage science team, the early advice was *Wait.* Don't do anything dramatic until we get more information (unless you have dead red pine, which is susceptible to attack by bark beetles that introduce bluestain fungus). Syrup producers were given the most current information available to determine which trees to tap and how many taps were appropriate, depending on how badly the tree was damaged.

"However," Nielsen says, "While we were gathering that early information, we quickly realized that there were some serious gaps, due mostly to the fact that previous ice storms were rarely followed with research. In the past, damage was documented, but recovery wasn't. For example, we could not find enough information to confidently predict mortality rates based on damaged sustained."

Lautenschlager notes that the authors of the preliminary guidelines had to rely on information from insect-defoliation studies; results of ice damage will likely be quite different. Adding to his concern about the lack of ice damage data is the fact that current climate-change predictions suggest that extreme weather events like ice storms could increase (for more on forests and climate change, see *Insights*, Vol. 3, No. 2).

Filling the ice-damage information gaps

In February 1998, Nielsen and Lautenschlager began working with researchers from MNR, CFS, the Eastern Ontario Model Forest, and universities to develop an ice damage science program, funded by the Ontario and federal governments. The components:

1. An-depth review of existing scientific literature and expert opinion on post-damage management of woodlots/plantations was conducted and published *(available from the MNR Southcentral Sciences Section, 3301 Trout Lake Road, North Bay, ON P1A 4L7, (705)475-5560).*

MNR stewardship coordinator Gary Nielsen views damage to a mixed hardwood stand near Kingston in February 1998. Photo: Cathy Nielsen

2. The Maple Project was set up to investigate how the ice storm and attempts to remediate the damage affect sugar maple health and syrup production. Treatment blocks for this integrated, manipulative, interdisciplinary study have been set up in privately owned sugar maple stands across the damage area. Located in 4 soil regions (Canadian Shield, limestone plain, Ottawa River Valley, St Lawrence River Valley), these stands represent the range of damage classes, from light to severe. Plots within blocks will receive 1 of 4 treatments (3 types of fertilizer and a control) in 1999. Response data will be collected for:

- *Vegetation* – changes in the abundance and cover of the major vegetation groups
- *Syrup production and tree health* – effects on sap volume/sweetness and wound closure and foliar nutrients (see below); links between fall root starch levels and spring sap production
- *Microclimate* – changes in soil moisture/temperature, air temperature, relative humidity, light, etc., that may affect sap production/ plant communities
- *Soil and foliar nutrients* – changes in soil nutrients and the trees' ability to take up, store, and use nutrients to grow and produce syrup
- *Soil microbial communities and processes* – changes in the types and quantities of soil microbes (healthy microbial communities help ensure trees obtain adequate nutrition)
- *Thinning* – the effectiveness of removing older, damaged trees in heavily damaged stands to favour younger, healthy trees
- *Vegetation control* – its effectiveness in ensuring moisture and nutrients are available to previously productive maples rather than less desirable plants

3. The Woodlots and Plantations Project will examine the storm's ecological and economic effects on stands used for timber production. Data will be collected on:

- *Types and extent of damage* by major tree species and/or species groups (stem form changes, probability of decay/insect damage, increases in coarse woody debris/snags/cavities in trees, changes in growth, etc.)
- *Changes in rates of disease, insects, stain, and decay* (some are likely to increase following a disturbance); susceptible red pine plantations will get special attention
- *Effects of damage and remediation measures* (such as selectively salvaging damaged trees) on the forest (trees, other vegetation, insects, songbirds) and the economy (at the stand, community, and regional scales)

Scientists will use some of this data to create computer-based decision-support tools to help landowners, forest managers, and governments determine the most cost-effective steps to take if another ice storm or similar disturbance occurs.

Disturbances: tough on people, good for forests?

Although the ice storm damaged many high-value trees, e.g., maples in sugar bushes, Nielsen and Lautenschlager note that it likely did the forest some good. "Disturbance, whether it's a fire, a spruce budworm outbreak, or an ice storm, is a major force shaping northern ecosystems," Lautenschlager explains. "It helps to renew the forest. Over the next 40 years, all those rotting branches will release nutrients for young trees to use. The increase in standing and fallen dead trees will provide prime habitat for many types of wildlife."

Negative effects of the storm, according to Nielsen, could include reduced populations of rare songbirds such as the cerulean warbler, which needs large undisturbed patches of forest. In addition, disturbed stands in the fragmented landscape of eastern Ontario are more susceptible to invasion by exotic plant species like European buckthorn.

Lautenschlager is also concerned that post-storm timber salvaging, which provided some landowners with quick cash, may reduce long-term forest health and productivity by further damaging recovering trees and/or reducing the nutrient pool on the site.

Involving stakeholders in the science

Lautenschlager and Nielsen stress that the questions they are studying came from the people who need the answers: syrup producers, forest industry, woodlot owners, conservation authorities, natural resource agencies, governments.

"A lot of people out there are asking for help," Lautenschlager says. "Thus we have been very careful to address their needs through communication and consultation, which have been foundations from the start. We have planned annual meetings to report our progress and are synthesizing and transferring results to clients and stakeholders as soon as they are available."

They also communicate regularly with researchers in Quebec, New York, Vermont, and other jurisdictions in the damage area to exchange information about their research plans, get feedback, and ensure their work is complementary.

Project timeline

Plans call for funding these studies through 2001, but Lautenschlager and Nielsen both say results then will be preliminary at best. Meaningful findings could take a decade or more. To ensure results of the various studies can be followed if funding permits, plot establishment is being documented carefully. To ensure results can be integrated, all data will be stored in a bank at the Canadian Forest Service in Sault Ste. Marie.

Project contacts: R.A. Lautenschlager at OFRI (ext. 228) and Cathy Nielsen, MNR Southcentral Sciences Section, Kemptville, (613)258-8238. Also see the ice-damage science overview article in the July/August 1999 Forestry Chronicle *(Vol. 75, No. 4). Other OFRI scientists involved: Tom Noland, Bill Parker. Other project partners: MNR Forest Management Branch, Sault Ste. Marie, and Forest Program Development Branch, Peterborough; the Ontario Ministry of Agriculture, Food, and Rural Affairs, Kemptville; the Canadian Forest Service, Sault Ste. Marie; Eastern Ontario Model Forest, Kemptville; the universities of Toronto, Calgary and Guelph.*

Stock Quality Assessment update:

New seedling test could enhance reforestation success

By Abigail M. Obenchain

Researchers with OFRI's Stock Quality Assessment Program are developing a new procedure for evaluating the condition of tree seedlings. According to scientist Steve Colombo, the new test assesses *cuticular transpiration (CT)*, or the rate of water loss from needles. Seedlings with lower CT have been shown to have needles with more developed cuticles (external tissue layers), as well as thicker layers of wax, which may help them retain water and avoid moisture stress.

"We have studies underway to determine whether seedlings with more developed cuticles and wax are more resistant to water-based herbicides." Colombo says. "What's more, we know that low-CT seedlings stored inside over the winter tend to have lower tissue-moisture content, which we think may make them less likely to develop storage moulds. We are also investigating the link between low CT and seedlings' ability to resist drying out while being stored outside in winter or during a drought after planting."

According to Colombo, research in alpine areas has shown that a *high* CT rate occurs when seedlings are exposed to cold before their foliage matures. Thus to ensure the cuticle and wax are well developed and keep CT *low*, nursery growers should ensure that seedlings experience a period of warm temperatures at the start of the hardening-off period, *before* lowering temperatures to increase frost hardiness.

The cuticular transpiration test, now commercially available on request from Mikro-Tek Labs in Timmins, is the latest in an array of seedling-assessment tools developed by OFRI over the last 7 years for the provincial Stock Quality Assessment Program. The other tests: visual damage assessment, chlorophyll fluorescence, root-growth potential, and stress-induced volatile emissions.

Two testing services are provided by Mikro-Tek: *seedling certification*, which confirms the suitability of stock for planting, and *problem stocklot testing*, which provides testing within 48-72 hours when growers or foresters suspect a problem (for example, when cold-storage breakdowns expose seedlings to high temperatures).

Over the years, OFRI and Mikro-Tek have tested samples from more than 1200 stocklots representing more than 400 million container and bareroot seedlings. Thus OFRI has been able to compile a unique database for comparing and rating seedling health, vigour, and potential field performance.

"The database is critical to ensuring that our testing results are meaningful," Colombo says. "We can compare the performance of each stocklot with a 7-year average for that species/stock type. To further ensure the quality and accuracy of our results, OFRI periodically crosschecks Mikro-Tek's results to ensure that the strictest testing standards are met."

Most of OFRI's seedling-assessment data relates to Ontario's 5 most important commercial species: black and white spruce and red, white, and jack pine. Some data have been collected for other species as well.

According to Colombo, the Stock Quality Assessment Program has prevented the planting of millions of dead or low-vigour seedlings. What's more, over the past few years, seedling quality has been improving steadily, and he believes this trend is at least partly due to the program. Many Ontario forest companies are now writing testing requirements into their contracts with growers.

Colombo adds that the stakes for plantation success will likely continue to rise if, as predicted, land available for timber production shrinks further.

The next step in this research will be to relate seedling-assessment data to field performance. By relating nursery practices to both seedling-testing results and field performance, researchers may be able to identify ways to grow seedlings that will increase growth and survival rates in Ontario's forest plantations.

OFRI's seedling-assessment contact: Steve Colombo (ext. 218). For information on getting stocklots tested, call Mikro-Tek at (705)268-3536 or e-mail mikrotek@onlink.net.

Tree diseases guide now available

The *Field Guide to Tree Diseases of Ontario*, a collaboration between the Canadian Forest Service and OFRI, has been reprinted. To obtain a copy, call the Canadian Forest Service office in Sault Ste. Marie (705-949-9461).

OFRI researchers part of new federal Centres of Excellence Network

By Abigail M. Obenchain

Gina Mohammed, Tom Noland, Steve Colombo, and Paul Sampson, all members of OFRI's Bioindicators Project team, have been named as partners in the new federal Geomatics for Informed Decisions (GEOID) Network.

This network is 1 of 17 sponsored by the federal Centres of Excellence Program, which seeks to improve the Canadian economy through research and development. The program is overseen by the Natural Sciences and Engineering Research Council, the Medical Research Council, and Industry Canada.

"This decision was a bit of a surprise, because there were more than 70 proposals for new networks from across Canada and from various scientific disciplines, and only 3 were accepted," Mohammed says. "Needless to say, we are extremely pleased."

The goals of the GEOID network are to improve Canada's geomatics system (already considered one of the best in the world), develop more effective geomatics tools to help resource managers make ecologically sound decisions, and coordinate geomatics research across the country.

Over the next 4 years, the network will receive about $12 million in funding, Mohammed says. These funds will be allocated to various geomatics projects conducted by the network partners. OFRI's Bioindicators Project, already underway, will nest into a larger GEOID project titled *Imaging Spectroscopy for the Management of the Canadian Landscape, With Emphasis on the Boreal Forest and Tundra*. The Bioindicators Project was set up in 1996 to develop physiologically based approaches, which are sensitive to changes in ecosystem function, to detect changes in forest condition. One of the methods under study uses special sensing equipment mounted on airplanes or satellites to "read" forests' *spectral signatures*, or the pattern of light their leaf canopies reflect up toward the sky (see *Insights*, Vol. 3, No. 2). The OFRI team, working with John Miller of the Centre for Research in Earth and Space Technology at York University, is investigating whether these spectral signatures can be linked to forest condition.

In 1998, researchers found that forest stands in various conditions in Ontario's Algoma Region *do* have significant differences in their spectral signatures. They also found promising correlations between spectral signatures and stand productivity measures such as stocking and basal area. The team hopes that this and future work will lead to a provincial system for assessing and rating forest condition and providing forest managers with early warnings of forest decline.

For more information on the Bioindicators Project or the GEOID Network, contact: Steve Colombo (ground truthing using physiology and mensuration; ext. 218), Gina Mohammed (spectral and fluorescence techniques; ext. 214); Tom Noland (biochemical attributes; ext. 227); Paul Sampson (stand structure; ext. 211). In addition to OFRI and the Centre for Research in Earth and Space Technology, GEOID network partners include the Canadian Forest Service, Quebec; Laval University and University of Sherbrooke, Quebec; the University of Alberta; the Canada Centre for Remote Sensing, Ottawa; and MacDonald Dettwiler, a private company in B.C. For more information on the Networks of Centres of Excellence, visit http://www.nce.gc.ca/.

What is *geomatics*?

Geomatics is a fairly new term that refers to the science and technology of gathering, analyzing, distributing, and using geographic information. OFRI scientist Gina Mohammed explains that traditional surveying and mapping techniques have evolved into sophisticated, computer-based technology such as:

- *Remote sensing*, or collecting geographic data using equipment mounted on satellites or airplanes
- Computer-based *geographic information systems* or *GIS*, which store, analyze, and display various layers of geographic information
- *Global positioning systems* or *GPS*, computer tools that receive signals from satellites to help in mapping the position of various features on the land.

Mohammed adds, "This scientific discipline has become increasingly important, because land managers are under increasing pressure to demonstrate sustainability at various scales, from small areas such as a forest stand to an entire province. Geomatics research is providing them with the tools they need to perform these complex tasks."

New bibliography describes decades of research at Algonquin Park reserve

By Abigail M. Obenchain

OFRI has published an annotated bibliography of more than 250 reports, papers, and other technology transfer products that document research conducted at MNR's Swan Lake Forest Research Reserve over the past 49 years. This 2,000-ha reserve was set up in Algonquin Park in 1950 to provide MNR researchers with a site for studying yellow birch regeneration.

According to OFRI scientist Bill Cole, who lead the bibliography project, "An amazing amount of information has come out of the work conducted at Swan Lake over the years. Researchers there not only solved the mystery of why yellow birch was not regenerating but also were pioneers in including ecosystem elements in forest research. In addition, they studied harvesting methods, tree quality development, the use of prescribed fire in hardwoods, and improvement of natural regeneration and growth of secondary species like black cherry, culminating in the publication of the provincial tolerant hardwood silviculture and tree-marking guides."

More recently, researchers at the Swan Lake Reserve have conducted forest-lake ecotone research that resulted in the discovery of 1,000-year-old logs along lake shorelines. Benchmark fish-ecology work has revealed that for several weeks in the spring, young-of-the-year brook trout actually forage on land, in the flooded forest-edge community.

Particularly during the first 40 years, most of what was learned at Swan Lake was communicated informally through presentations and internal reports, Cole says. "To protect the Ministry's substantial investment at Swan Lake, we felt it was critical to ensure that *all* information that came out of work done there was compiled, archived, and made accessible, especially since most of the people who worked at Swan Lake are no longer with MNR."

This bibliography complements the Swan Lake GIS (see *Insights*, Vol. 3, No. 1) and will be linked to NRVIS, the MNR's master database.

OFRI's Swan Lake contact: Bill Cole (ext. 113). Swan Lake management partners: MNR Southcentral Sciences Section, Algonquin Provincial Park, and the Algonquin Forestry Authority. To obtain the Swan Lake Forest Research Reserve Annotated Bibliography *(Forest Research Information Paper No. 144), call the OFRI publication request line (ext. 271) or e-mail ofriin@gov.on.ca.*

UPCOMING EVENTS

September 21-22, 1999: *The Ecology and Management of White Birch,* Wawa; contact Wally Bidwell, MNR Boreal Science Workshops, South Porcupine (705)235-1236.

September 28-29, 1999: *The Ecology and Management of Eastern White Cedar,* Hearst; contact Wally Bidwell, MNR Boreal Science Workshops, South Porcupine (705)235-1236.

September 28-30, 1999: *33rd Annual Midwest Mensurationists Meeting,* Sault Ste. Marie; contact David Smith at OFRI (ext.118) or visit http://dendron.fr.umn.edu/mmm1997/pastmtgs.html.

October 1-4, 1999: *Forest Communities in the Third Millennium: Linking Research, Business, and Policy Towards a Sustainable Non-Timber Forest Product Sector,* Kenora; contact Iain Davidson-Hunt, Taiga Institute, (807)468-9607 or visit http://web.uvic.ca/ntfp/conferences.html.

October 26-29, 1999: *Monitoring Salamanders,* North Bay; contact Andrée Morneault, MNR Southcentral Sciences Section, (705)475-5566, morneaa@gov.on.ca.

May 14-18, 2000: *A Conference for Canada's Forest Sector in the Millennium Year,* Thunder Bay; contact Canadian Forestry Association at (613)232-1815 or cooligd@gov.on.ca.

news

Bill Cole is OFRI's new hardwood ecosystem research scientist. He will be working closely with MNR Southcentral Sciences staff on various tolerant hardwood stand-management research projects. He will also work on hardwood forest-lake ecotone guidelines based on his previous work as OFRI's forest-lake ecology research scientist.

OFRI resources/program operations manager **Terry Taylor** has accepted a 1- to 2-year secondment with the Ministry of Northern Development and Mines.

Have a suggestion?

Want more information on a research project?

We want to hear from you!

CONTACT: ***Insights*** Editor
(or the specific OFRI researcher)

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